Egeberg base ... ... 2025·28316 toises,

with a probable error of ± 0·00129, or $\frac{1}{1,570,000}$ of its length.

Rindenleret base ... ... 1806·3177 toises,

with a probable error of ± 0·00120, or $\frac{1}{1,500,000}$ of its length.

This is a high degree of accuracy as compared with older base lines (as for instance several base lines measured in France between 1798 and 1828, of which the probable errors are $\frac{1}{250,000}$); but this accuracy has frequently been attained of late years, and even surpassed, as, for instance, the base line of Madridejos, measured by General Ibañez in 1858, with a probable error of $\frac{1}{5,865,800}$.

Part II is the account of the connection of the Egeberg base with the side Toass-Kolsaas, and Part III. that of the connection of the Rindenleret base with the side Stokvola-Haarskallen of the principal triangulation. The observations were made during 1864-66, but owing to an error at one of the stations, due to the bisection of a wrong object, further observations were made at that station in 1877. The connection in each case is very complete, and the work is well tied in. The centres of the trigonometrical stations were very carefully defined by letting an iron bolt into the rock, or, into a large block of stone; the centre of the face of this bolt, marked by a small hole, was the trigonometrical station. The signals, to which the observations were taken, consisted of an upright beam, to which was attached one or two boards about 0·75 m. square, which were painted white or black, and occasionally a vertical stripe 0·11 m. broad was painted on the centre of the board. At several of the stations the theodolite could be placed beneath the signal, and at such stations the signal was placed over the bolt, but in several cases, owing to the nature of the ground, or other causes, the trigonometrical station had to be placed at some distance from the signal, in one case as much as 54 Norwegian feet. In such cases the corrections to be applied to the observations were obtained by measuring a short base line, one end of which was the trigonometrical station, and the direction nearly at right angles to the line joining the station and the signal. Observations were taken from the ends of this base to the various points on the signal, which were bisected from the other stations, and these, together with the observed bearings to and from the other stations, enabled the necessary corrections to be made. The greatest correction thus required was 10′ 37″·34. But even at stations where the theodolite was placed beneath the signal, corrections were required to reduce the observations to the trigonometrical station, because different points on the signal were observed from the other stations, and these points were not vertically over the bolt. In these cases the corrections were computed in the following manner:—A piece of paper, mounted on a board, was placed horizontally on the ground over the centre of the station, and this centre marked on it. Then, by means of a small theodolite, the "traces" of the vertical planes passing through the various points observed to, were marked in pencil on the paper. The theodolite was now shifted, and the corresponding traces marked as before; the intersections of these traces gave a series of points vertically beneath the points on the signal to which observations had been made. From these points, the corresponding bearings to the various stations were plotted on the paper; and, lastly, perpendiculars were dropped, from the point representing the centre of the station, on to these bearings; the length of any one of these perpendiculars divided by the approximate distance to the corresponding station is the tangent of the correction to be applied.

Two instruments were used for measuring the angles; a 10″ universal instrument by Olsen, read by two micrometer microscopes, and a 12″ theodolite by Reichenback, read by four verniers. The errors of graduation of these instruments were investigated, and are given in a tabular form in Part II. Although, owing to the numerous observations taken to each object starting from different parts of the horizontal limb, the errors of graduation must have been eliminated to a very large extent, yet it was thought advisable to apply these corrections to the observations, in order to obtain a more accurate idea of the bearings of each station. The errors of the micrometer microscopes are also given in a table. The 10″ instrument was used at all, the 12″ theodolite appears to have only been used at two, stations. A third instrument, a 10″ universal instrument by Breithaupt and Sons, was used for the observations of 1877.

When observing, the instrument was first set at 0°, and a round of angles taken: the telescope was then reversed and the round taken again. The instrument was then set at 15° in the case of the triangulation connecting the Egeberg base, and at 20° (nearly) in the case of the Rindenleret base triangulation, and two rounds taken as before. The instrument was then again moved on 15° and 20° respectively, and so on. Thus in the first case forty-eight, and in the second thirty-six observations were taken to each station. In some few instances even a greater number were taken. The actual observations are not given in the Report, only the mean of four observations—two taken in the same position of the horizontal limb, and two in that position increased by 180°. The time occupied at each station averages four days; some stations were completed in two days.

The observations were compensated by the method enjoined by the Association for the measurement of degrees in Europe, namely, Bessel's method. The observed angles at each station are first compensated amongst themselves. A correction is then applied to each angle thus found, subject to the condition that the sum of the squares of these corrections for the whole triangulation is a minimum, and subject further to the geometrical conditions that the sum of the three angles of a triangle = 180 + spherical excess, and that the length of any side is the same by whatever *route* it is calculated. The necessary calculations are very laborious, and in the case of the Rindenleret base require the solution of simultaneous equations containing seventy-six unknowns. It is very questionable whether the result repays this labour; the method of compensation adopted for the Ordnance Survey, although perhaps not so rigid, compares favourably in this respect. The calculations for compensation are given very fully in the Report.

The Report is accompanied by plates showing the base measuring apparatus and the connecting triangulations.

ELEMENTS OF THE GREAT COMET OF 1882

(*Communicated by Vice-Admiral Rowan, Superintendent U.S. Naval Observatory*)

THE following elements were computed from three observations made at the U.S. Naval Observatory; the first and last being made with the Transit Circle, and the middle one compared with a known star which was afterwards observed on the Transit Circle:—

Wash. M.T.		App. α. (h. m. s.)		App. δ. (° ′ ″)
Sept. 19·9697877	...	11 14 18·94	...	− 0 34 29·7
Oct. 8·7204363	...	10 28 6·63	...	−10 40 22·6
Nov. 4·7009228	...	9 6 16·22	...	−27 21 26·7

From these observations we deduce—

Perihelion Time = Sept. 17·2228200 Greenwich Mean Time.

$$\left.\begin{array}{rl} \Omega = & 346^\circ\ 1'\ 7''{\cdot}91 \\ \pi - \Omega = & 69\ 36\ 12{\cdot}79 \\ i = & 141\ 59\ 52{\cdot}16 \\ \phi = & 89\ 7\ 42{\cdot}70 \\ \log a = & 1{\cdot}9331366 \\ \log q = & 7{\cdot}8904739 \end{array}\right\} 1882{\cdot}0$$

$$\text{period} = 793{\cdot}689 \text{ years}$$

$$\delta\lambda \cos\beta = -0''{\cdot}06 \quad \delta\beta = +0''{\cdot}01$$

$$\begin{array}{l} x = r\,[9{\cdot}9951411] \sin (170^\circ\ 42'\ 12''{\cdot}72 + v) \\ y = r\,[9{\cdot}9877234] \sin (262\ 46\ 57{\cdot}39 + v) \\ z = r\,[9{\cdot}4435130] \sin (\ 49\ 20\ 25{\cdot}11 + v) \end{array}$$

The observations as given were afterwards corrected for parallax by means of elements previously computed. These elements bear a considerable resemblance to Comet I., B.C. 371; and it may possibly be its third return, a very brilliant comet having been seen in full daylight A.D. 363.

E. FRISBY,
Prof. Math., U.S.N.
Washington, Dec. 19, 1882

THE DUMAS MEDAL

WE recently (vol. xxvii. p. 174) gave the addresses at the Paris Academy of Sciences in connection with the presentation to M. Dumas of a medal in commemoration of the fiftieth anniversary of his election to the Academy. We are now able, by the courtesy of our French contemporary, *La Nature*, to reproduce an illustration of this medal, which was presented by M. Jamin in words both eloquent and touching, as a token of the "love and gratitude" of the distinguished chemists' *confrères*, pupils, and friends. The medal is the work of M. Alphée Dubois.

PROFESSOR VON GRAFF'S MONOGRAPH ON THE TURBELLARIANS[1]

THIS splendid folio monograph consists of two volumes, the one comprising the text of over 600 pages illustrated by woodcuts, the other twenty as beautifully executed partially coloured plates as have ever been turned out, all from the author's own original drawings. The publication of the work has been assisted by a grant from the Berlin Royal Academy of Sciences.

Ludwig von Graff is Professor of Zoology at the College of Forestry at Aschaffenburg, in Bavaria. His first memoir on Turbellarians was published in 1873, at which time he first made up his mind to work out from his own observation a revision of the Turbellarians. The present monograph is, as he tells us in the preface, the result of almost incessant work during the last five years. He has made numerous journeys to the Naples and Triest stations, and has also visited many other parts of the European coasts north and south, and the fresh waters in all directions, in order to pursue his investigations on living Turbellarians. He has thus been able himself to examine 70 out of the 168 species of Rhabdocœlida which are known with certainty. The work being thus founded on so wide a personal acquaintance with the forms of which it deals, is of especial weight and value; it constitutes a systematic monograph of the Rhabdocœlida, founded on a sound basis of anatomical structure, and embracing all species hitherto described by other observers, together with those discovered by the author himself (thirty new species).

It is doubtful whether the present work will be followed by a second part embracing in a similar manner all the known Dendrocœlida. The matter depends on the amount of ground which may be covered by Dr. A. Lang's forthcoming monograph on Turbellarians, in the "Fauna and Flora of the Gulf of Naples." If this monograph proves to be so comprehensive that a further one would be superfluous, then Prof. Graff will publish a quantity of material collected by him concerning the Dendrocælida, in three smaller memoirs on the Polyclada, the Triclada, and embryology respectively. The present work is appropriately dedicated to the memory of O. F. Müller and Sir John Dalyell. It is pleasing to find the great merits of the latter thus recognised by a foreign naturalist.

The author does not admit Sidonia = *Rhodope varanii*, which, in opposition to Dr. R. Bergh, he considers to be a nudibranch, or Dinophilus, which has lately been shown to lie near the Archiannelids amongst the Turbellarians; and in the definition he gives of the group excepts the Microstomida, which differ from all other Turbellaria in having a complete periœsophageal nerve ring, in being diæcious, and in multiplying asexually by budding.

Separating, as is now so usual, the Nemertines altogether from the Turbellarians, he divides the group into the Rhabdocælida and Dendrocælida. In the definition given of the two sub-orders, an interesting point of difference is brought out, namely, that in the former the yelk glands are always present in the form of a pair of compact glands, whereas in the latter they are always divided up into numerous separate follicles.

The Rhabdocælida are divided by the author into three groups: I. Acœla; II. Rhabdocœla; III. Alloiocœla, which are thus defined:—

[1] "Monographie der Turbellarien." 1. Rhabdocœlida. Dr. Ludwig von Graff. (Leipzig: W. Engelmann, 1882.)